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CURRENT LITERATURE

BOOK REVIEWS

Oxidations and reductions

DAKIN'S monograph[1] on oxidations and reductions in the animal body is of interest to the plant as well as animal physiologist. Chap. i includes an introduction and discussion of the nature of oxidizing and reducing agents in the body as well as the methods of investigation. Chap. ii deals with the oxidation of saturated fatty acids, unsaturated acids, fatty acids with branched chains, and dibasic acids. Chap. iii discusses the oxidations of α amino, α hydroxy, and α ketonic acids, the oxidation of phenylalanine, tyrosin, tryptophane, and related substances, and the oxidation and reduction of amino acids by microorganisms. Chap. iv treats of the oxidation of carbohydrates; chap. v of the oxidation of purin derivatives; and chap. vi of the oxidation of hydrocarbons, phenols, aldehydes, amines, and indol derivatives. The volume also includes a bibliography of 21 pages and a full index.

A quotation from the preface gives the point of view of the work: "The statement that fats and sugars are oxidized in the body to carbon dioxide and water, while proteins yield urea in addition, are no longer considered all-sufficient explanations of the chemical rôle of these in animal economy. The study of chemical structure is rapidly changing the whole aspect of biological science, and we may confidently look forward to the time when the orderly succession of chemical reactions constituting the activities of the living cell will be resolved into their individual phases." The author does not enter into "the purely biological aspects of the subject, and also the thermodynamics of the problem of oxidations and reductions have been necessarily omitted as outside the scope of the work. References to many enzymes, oxygenases, peroxidases, etc., which, so far as is known, are without action upon the principal groups of substances which furnish energy to the organism, have also been omitted."

In discussing the nature of the oxidizing and reducing agents of the animal body, he treats as improbable the SCHONBERN theory of "activation of oxygen in its polymerization," the CLAUSIUS and VAN'T HOFF view of the separation of the oxygen into its atoms or ions, and the HOPPE-SEYLER conception of the resolution of the oxygen by nascent hydrogen or other reducing agents. He accepts as very probable the MORITZ TRAUBE peroxide theory of oxidation.

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[1] DAKIN, H. D., Oxidations and reductions in the animal body. pp. viii+135. New York: Longmans, Green & Co. 1912. One of the monographs on biochemistry.

The main evidence for the theory is the likeness between the oxidations produced in the animal body and those produced in vitro by hydrogen peroxide. It is held that hydrogen peroxide cannot be the effective peroxide in the organism because of the general presence of catalase in active tissues. Organic peroxides are probably the effective agents. The following are listed as peroxide-forming substances: elementary metals and non-metals (hydrogen, phosphorus, zinc, etc.), hydrocarbons, terpenes, alcohols, aldehydes, acids, carbohydrates, ethers, phenols, and aromatic bases and alkaloids.

The following are a few of the reactions mentioned that show the resemblance between the oxidations in the animal body and those carried on in vitro by hydrogen peroxide. The normal fatty acids in the body undergo oxidations in the β position, butyric acid yielding acetoacetic acid. Hydrogen peroxide alone of all the various chemical oxidizing agents brings about precisely the same reaction.

$$\underset{\text{butyric acid}}{CH_3CH_2CH_2COOH} \rightarrow \underset{\text{acetoacetic acid}}{CH_3COCH_2COOH}$$

Glucose may be oxidized to glucoronic acid in the body, while hydrogen peroxide is the only reagent capable of effecting this change outside the body. Benzene is oxidized in the body to phenol, catechol, and quinol, and precisely the same reaction is brought about by hydrogen peroxide, but by scarcely any other reagent. Among the dibasic acids, oxalic acid is oxidized readily by most laboratory reagents, but malonic, succinic, and glutaric less readily. In the body oxalic acid is oxidized with great difficulty, but the other three mentioned above very easily. The salts of these dibasic acids act similarly toward hydrogen peroxide. The saturated and unsaturated fatty acids are about equally readily oxidized in the body and by hydrogen peroxide. To most laboratory reagents the saturated acids are far more resistant than the unsaturated. It seems probable from this that botanists[2] are wrong in assuming the greater ease of oxidation of unsaturated acids in the plant.

We need not enter into our knowledge of the details in the course of the complete oxidation of any of the various substances yielding energy. It will suffice to say that many steps are not yet known and others are in dispute, but it is evident that the course of oxidation of any one substance varies considerably with the conditions. The following quotation emphasizes a point commonly stated by botanists: "The specific character of animal oxidations is most remarkable, especially when phenomena such as those presented by diabetes and alcaptonuria are concerned. In these conditions oxidations of a single readily oxidizable product of metabolism (glucose and homogentisic acid) may be completely restrained without in the least impairing the capacity of the body for effecting the oxidation of other substances.—WILLIAM CROCKER.

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[2] BOT. GAZ. **54**:543–545. 1912.